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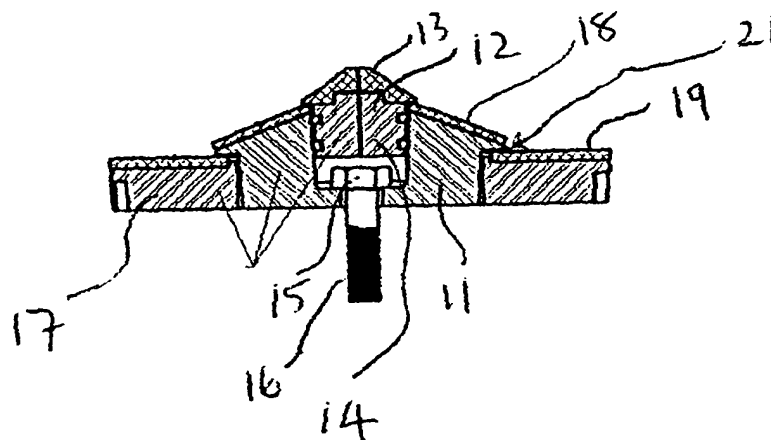
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(54) Title: ROTARY MINERAL BREAKER DISTRIBUTOR PLATES



(57) Abstract: A rotary mineral breaker of the type having a distributor assembly of a rotor able to rotate about a substantially vertical axis to receive under gravity axially mineral pieces. The rotor comprises a first component and a second component. The first component at least in part is steeper with respect to the horizontal surface of the second component resulting in an overall mineral distributing surface contour about the rotor.

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**“ROTARY MINERAL BREAKER DISTRIBUTOR PLATES”****TECHNICAL BACKGROUND**

The present invention relates to components and assemblies incorporated in or  
5 to be incorporated in a mineral breaker, such as for example, that typified by the  
BARMAC™ brand rotary mineral breakers such as disclosed variously in US Patent  
4,662,571 and 4,586,663, New Zealand Patent 250027, PCT/NZ97/00108,  
PCT/NZ98/00076 and PCT/NZ98/00075.

The present invention also relates to methods of fabrication of components and  
10 the resulting assemblies suitable for such machines or as replacement parts for such  
machines.

**BACKGROUND ART**

In the BARMAC™ type mineral breaker (eg; of US Patent 4,662,571) a rotor  
receives under gravity a substantially axial flow of mineral pieces to be further  
15 diminished in size. These pieces are thrown radially from the rotor after transiting a bed  
of rotor retained mineral pieces. Such thrown pieces impinge on a surrounding bed of  
earlier thrown mineral pieces thereby, by mineral piece to mineral piece interactions,  
providing the diminution of particle size. The particles of reduced size eventually fall  
from the machine.

20 A feature of the device is the wish to minimise wear. It is for this reason, where  
possible, as many interactions as possible are between mineral pieces with as few as  
possible being on non-sacrificial readily replaceable surfaces forming part of the  
machine itself. Where it is necessary to allow contact and thus wear there is preferably  
some enhancement of wear surfaces by the use of appropriate materials (such as  
25 tungsten carbide as the sacrificial surface of otherwise steel wear plates and for the  
otherwise steel distributor plate surface) although hard steel alloys such as high chrome  
alloys have been used in the past without enhancement (eg; a full covering with  
tungsten carbide) for backing plates.

As shown herein in Figures 1A and 1B there is BARMAC™ type machine (such  
30 as disclosed in PCT/NZ98/00076) which utilises a distributor plate designated as ‘A’  
in the aforementioned Figures 1A and 1B. Whilst such a distributor plate may be flat

it may also be conical, dome-like or of some other appropriate three dimensional surface shape. Such a distributor plate is difficult to manufacture for larger sizes where there has been used a steel or the like low cost substrate to which is adhered or otherwise fixed a shaped piece or multiple pieces of an appropriate hard yet sacrificial material, e.g. tungsten carbide.

## DISCLOSURE OF THE INVENTION

Whilst constructions have previously been considered where "petals" of tungsten carbide material are adhered to substantially conform to the underlying substrate steel surface contour the positioning and retention of the petals of tungsten carbide have been difficult to achieve. Such difficulties have been greater with larger diameter distributor plates.

The present invention is directed to components of a distributor plate and/or the assemblies thus fabricated.

In a first aspect the present invention consists in a distributor assembly of the rotor of a rotary mineral breaker, said rotor being of a kind adapted to receive under gravity substantially axially of the rotor mineral pieces to be broken and at least initiate the outward flow of such mineral pieces, said distributor assembly defining, with a first component, a wear resistant surface at least adjacent and about the rotor axis to receive in use at least some of said mineral pieces under gravity, and, with a second component, a wear resistant surface peripherally about at least said wear resistant surface of said first component,

wherein said first component defines a wear resistant surface that at least in part is steeper with respect to the horizontal than the wear resistant surface of said second component.

Preferably said wear resistant surface is of a material affixed to and/or embedded in a substrate of that same component.

Preferably said wear resistant surface is defined by an appropriate carbide.

Preferably said second component defines a wear resistant surface greater in area when viewed in horizontal plan than the corresponding area of the wear resistant surface of said first component when also viewed in horizontal plan.

Preferably at least part of said second component underlies and is captured in use

to said rotor by said first component.

Preferably fixing means locates said first component relative to the rotor and in use such location of the first component locates said second component.

Preferably said fixing means of said first component relative to the rotor is a  
5 rotor axis aligned bolt that engages into or through the rotor base.

Preferably said first component at least in part overlies part of said second component and at least in part is positioned within said second component so as to be capable of locating said second component between said first component and the rotor base so as to present a wear resistant surface of said second component about a wear  
10 resistant surface of said first component.

Preferably said second component is capable of being rotated about the rotor axis without removal of said first component to thereby present different zones of the wear resistant surface of said second component as zones of preferential wear in use.

Preferably said fixing means is a bolt at the rotor axis engaged into or through  
15 the rotor base and the head of said bolt is in turn protected by a cap substantially centrally positioned with respect to said first component.

Preferably said cap is provided with a wear resistant surface and is at least in part received within a recess centrally of said first component above the head of said bolt.

Preferably there is in addition at least one further component itself defining a  
20 wear resistant surface to be positioned more peripherally than the wear resistant surface of said second component, at least one of said first or second components directly or indirectly providing a capturing or location effect with respect to the rotor of the additional component or components.

Preferably the wear resistant surface of said second component is of substantially  
25 a simple horizontal annulus or a shallow rise frustoconical variant of such an annulus.

Preferably said first component is substantially of conical (which includes frustoconical), dome or bell shape in nature.

Preferably said wear resistant surface of said first component is symmetrical about the axis of the rotor.

30 In another aspect the invention is a **first component** for a distributor assembly as previously defined.

In another aspect the invention is a **second component** for a distributor assembly as previously defined.

In another aspect the present invention consists in or for a **rotary mineral breaker, a multi-tiered distributor plate** being a composite of at least

5 a first component in the rotor or capable of being positioned in the rotor so as to be surrounded at least in part by a second component, and  
a said second component,

the arrangement being such that in use said first component assists in locating a mineral contacting part of said second component about the rotor axis.

10 Preferably said second component defines an annular or the like region about a central region, the central region being defined at least in part by said first component.

Preferably said first and second components is fabricated so as to be provided with a wear resistant surface.

Preferably said first component at least in part overlies said second component.

15 Preferably the apparatus in rotor of a rotary mineral breaker provides or will provide an assembly of the present invention as previously defined.

In yet another aspect the present invention consists in a **distributor plate** for a rotary mineral breaker comprising or including

20 a first component capable of being positioned at least in part over and at least in part within a second component, and

a said second component, the two components being capable in a rotor of defining a compound mineral distributing surface contour over at least part of the base of the rotor.

25 Preferably said first component is capable of being fixed to the rotor at the rotor axis.

Preferably each such component has been formed of a substrate material carrying a wear resistant material such that, in use, such wear resistant material defines said mineral distributing surface contour.

30 Preferably when in use the rotor of a rotary mineral breaker provides or will provide an assembly of the present invention as previously defined.

Preferably each of said first and second components has at least part of the

surface thereof to forming or to form part of said compound mineral distributing surface contour defined by an appropriate sacrificial material.

Preferably said appropriate sacrificial material is a carbide.

Preferably said appropriate carbide is tungsten carbide.

5 In another aspect the present invention consists of **a method of providing a compound mineral distributing surface contour in the base of the rotor of a rotary mineral breaker**, said method comprising or including

assembling by pre-assembly or sequential positioning within said rotor a first and second component of a kind as previously defined (if sequentially positioned, said  
10 second component being placed first), and

thereafter attaching said first component to the rotor so as to capture both said second component and said first component to the rotor base.

In another aspect the present invention consists **in or for a rotary mineral breaker, a composite distributor plate** being an assembly of two or more members,  
15 each of which members has a carbide wear resistant surface.

Preferably the base of the rotor of such apparatus by one of said members only, at least one other such member being rotatably captured to the rotor by that member fixed to said rotor base.

In another aspect the invention is any mineral deflector or distribution  
20 component of or for a rotor of a rotary mineral breaker, said component being substantially of a kind herein described with reference to any one or more of the accompanying drawings and which forms or is to form part only of a mineral distributing surface of such a rotor over or as part of the base thereof.

To those skilled in the art to which the invention relates, many changes in  
25 construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the scope of the invention as defined in the appended claims. The disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting.

#### **DETAILED DESCRIPTION OF THE INVENTION**

30 Preferred forms of the present invention will now be described with reference to the accompanying drawings in which;

**Figure 1A** is a perspective cutaway diagram of a BARMAC™ type machine as previously defined by way of reference, the letter "A" indicating the distributor plate,

**Figure 1B** is an enlarged view of the rotor in a machine of the kind shown in **Figure 1A** showing the disposition of the distributor plate "A" with respect to a retained  
5 bed of mineral pieces supported by the rotor between a wear plate at the exit port from which the migrating mineral pieces are thrown as well as a shaping plate at the back of the bed,

**Figure 2** shows an assembly which substitutes for distributor plate "A" in such a machine as depicted in **Figures 1A** and **1B**,

10 **Figure 3A** shows the first member of an assembly as shown in **Figure 2**, the first member having a substantially annular contoured surface of a wear resistant material such as tungsten carbide over the substrate steel or other support,

**Figure 3B** shows the second member which is substantially frustoconical or dome shaped and has a corresponding wear resistance surface (eg; of tungsten carbide)  
15 and which second member is capable of being centrally placed over the member shown in **Figure 3A** and held together by appropriate means as shown in **Figures 2, 4** and **5**,

**Figure 4** is a perspective view from above of the arrangement as shown in **Figure 2**,

**Figure 5** is a transparent side elevation showing the assembly of the **Figures 2**  
20 and **4**,

**Figure 6** is a plan view of a preferred distributor assembly of a rotor showing an annulus of the second component exposed beyond a partial overlaid zone of the frustoconical first member, such first member being held in place to the rotor base (not shown) by a bolt the head of which is capped by the receiving of an appropriate capping  
25 member within a central recess of said first component,

**Figure 7** is a section of the assembly of **Figure 6**, and

**Figure 8** is an exploded view of the assembly of **Figures 6** and **7** showing how if desired notches in the substrate of the second member can be used to relocate sacrificial areas being typical areas of high wear corresponding to the number of exit  
30 ports on the rotor (in the case of **Figures 6** to **8** - three exit ports), such incremental rotation regularly ensuring a maximum use of the sacrificial impact/wear resistant

carbide surfacing of said second component.

The present invention relates to multi-tiered distributor plates (eg; two, three or more tiers) but hereafter the description will refer primarily to two tiers. Three tiers are preferred however for rotors with a tip radius in excess of 450 mm [17½"] (e.g; for 1.2 m rotor).

The present invention recognises the difficulty in holding about a central region any large expanse of tungsten carbide or other carbide in place due to the centrifugal and impact forces.

In accordance with the present invention the centre unit (ie; the second member) provides a positive location of at least part of the annulus of tungsten carbide or the like of the outer ring (ie; the first member). This assists in the resistance of the centrifugal forces and such mechanical hold-down renders less important the bond (if any) between the substrate of such second member and its tungsten carbide or the like protective surface layer.

The present invention also recognises that with the mechanical separation of the parts being possible maintenance is rendered more easy. The first component is of a part hitherto available in more or less the same form as herein described from applicant for lesser diameter rotary mineral breakers.

Different parts of a composite distributor plate, depending on the wear pattern experienced in a particular machine, will require replacement ahead of others. There can of course also be the provision of different grades or harnesses of the wear resistant materials capping or providing the wear resistant surface of one or both of said first and second members to suit the differing conditions from the centre to the outer ring, ie; from the impact in the middle to the rubbing on the outside.

In one preferred form of the present invention the distributor plate "A" of the machines of Figures 1A and 1B are replaced at least for larger diameter rotor machines with an assembly as depicted in Figures 2 to 5.

In one preferred form of the present invention the second member 1 (see Figure 3A) is provided as a substrate of steel or steel alloy 2 and an annulus 3 of tungsten carbide which has been adhesively affixed to the substrate 2.

As shown in the embodiment in the drawings, component 1 includes a central



hole 4 surrounded by a recess 5 which will accommodate a head of a fixing bolt 6. It is that head of the bolt 6 which is provided with a female thread into which a bolt 7 for the second member 8 is to engage to locate the first component 8 over and to the second component 1. Of course a single through bolt could instead be used.

5       The member 8 itself is provided with a substrate 9 (preferably of a steel) and is provided with one or more pieces (preferably one) of tungsten carbide 10 which in a manner similar to that depicted in Figure 6 and, as previously described in relation to the second component, locates the tungsten carbide to the substrate 9. The member 8 however preferably has the configuration shown in Figures 4 and 5.

10       As can be seen from the drawings an effective distributor plate of a composite type form from two main members (each composite in themselves) provides a sufficient degree of contouring centrally notwithstanding the flatness of the tungsten carbide annulus 3 of the second member 1. This makes much easier the provision of large diameter distributor plates since only the relatively small central part thereof has any  
15   contouring of significance that makes fabrication more difficult.

The use of steel bolt/set screw 7 is in a low impact density area of the distributor and need not be, but can be, protected.

To ensure accuracy of fit and certainty of adhesion preferably an appropriate adhesive (eg; ESP110 Permabond™ of National Starch and Chemical Company) is used  
20   between the tungsten carbide and the substrate metal which preferably is an appropriate steel, for example, mild steel. Optionally the carbide can be in mould moulded into a substrate metal.

The most preferred form of the present invention (but for ease of explanation being described in respect of a three exit mineral breaker of the aforementioned  
25   BARMAC™ type) has a first component 11, a second component 17 and a capping member 12 which overlies a fixing bolt 16 adapted to associate the first member 11 into or through the base of the rotor.

As depicted each of the components 11, 12 and 17 is fabricated to include respectively wear resistant surfaces of adhered carbide 18, 13 and 19 respectively. In  
30   each instance preferably the substrate that supports such wear resistance surfacings is of an appropriate steel.

As shown in its assembled form in Figures 6 and 7, the preferential zones of wear appear on the flat annulus 19 at zones "W". Notches 20 in the perimeter of the substrate of the second member 12 enables different regions "W" to be presented, each area "W" being dictated by the relative positioning of the rotor exit relative to the second member wear resistant surface 19. Such periodic or regular turning of the free to rotate second component 19 relative to the still fixed first component 11 is preferably despite fixing bolt 16 being unloosened and still with its head 15 protected by the capping member 12 is assured.

As can be seen, the arrangement of Figures 6 through 8 is such that variously the capping member could be considered as a first component with respect to the component 11 just as the component 11 is a first component with respect to the second component 17.

Persons skilled in the art will appreciate therefore how a sequence of components can be provided to provide a compound wear resistant surface with the most simple shapes of the wear resistant surface (those of lesser 3-D detail [and indeed preferably flat as for 19]) more outwardly from the rotor axis.

In use "O" rings 22 can be utilised to locate the composite capping member 12 within the central recess of the first component 11 above the bolt head 15 with part of the wear resistant attachment to the capping member substrate 14 overlaying the top edge of the wear resistant layer 18 of the member 11. The wear resistant layer 18 in turn laps over the inner extremities of the wear resistant surface 19.

The present invention therefore envisages a simple fixing operation for component 11 utilising a bolt capable in turn of being protected by a push-in cap. When fixed relative to the rotor base the first member 11 holds captive and locates the second member 17 and its peripheral wear resistant surface 19 but still allowing its movement in order to maximise its life.

When the life of surface 19 is over member 17 it can readily be removed by release of the bolt 16 and the removal of the capping member to release the first component and in turn the second component. Such a surface 19 is cheap to replace owing to its generally planar nature.

Persons skilled in the art will appreciate how variations on the theme described

are possible but still are within the scope of the present invention. Whilst an option is to provide non rotation of the second component 17 persons skilled in the art will appreciate how maintenance down time is greatly reduced if that component is free to turn. To this end preferably a 1mm clearance gap is provided between the adjacent  
5 surfaces commencing at 21 between the member 11 and the member 17.

Persons skilled in the art will appreciate how only one small part of the overall product needs to be provided with a contoured protected surface with the majority of the composite product being provided with a simple flat, tungsten carbide or other shielding material. This therefore cheapens the cost of the provision of a replacement  
10 assembly or part thereof and should find widespread acceptance.

**CLAIMS:**

1.     **A distributor assembly of the rotor of a rotary mineral breaker**, said rotor being of a kind adapted to receive under gravity substantially axially of the rotor mineral pieces to be broken and at least initiate the outward flow of such mineral pieces,  
5     said distributor assembly defining, with a first component, a wear resistant surface at least adjacent and about the rotor axis to receive in use at least some of said mineral pieces under gravity, and, with a second component, a wear resistant surface peripherally about at least said wear resistant surface of said first component,  
       **wherein** said first component defines a wear resistant surface that at least in part  
10    is steeper with respect to the horizontal than the wear resistant surface of said second component.
2.     A distributor assembly of claim 1 wherein each said wear resistant surface is of a material affixed to and/or embedded in a substrate of that same component.
3.     A distributor assembly of claim 1 or claim 2 wherein said wear resistant surface  
15    is defined by an appropriate carbide.
4.     A distributor assembly as claimed in any one of the preceding claims wherein said second component defines a wear resistant surface greater in area when viewed in horizontal plan than the corresponding area of the wear resistant surface of said first component when also viewed in horizontal plan.
- 20    5.     A distributor assembly as claimed in any one of the preceding claims wherein at least part of said second component underlies and is captured in use to said rotor by said first component.
6.     A distributor assembly as claimed in claim 1 to 5 wherein fixing means locates said first component relative to the rotor and in use such location of the first component  
25    locates said second component.
7.     A distributor assembly as claimed in claim 6 wherein said fixing means of said first component relative to the rotor is a rotor axis aligned bolt that engages into or through the rotor base.
8.     A distributor assembly as claimed in claim 6 or 7 wherein said first component  
30    at least in part overlies part of said second component and at least in part is positioned within said second component so as to be capable of locating said second component

between said first component and the rotor base so as to present a wear resistant surface of said second component about a wear resistant surface of said first component.

9. A distributor assembly as claimed in claim 8 wherein said second component is capable of being rotated about the rotor axis without removal of said first component  
5 to thereby present different zones of the wear resistant surface of said second component as zones of preferential wear in use.

10. A distributor assembly as claimed in claim 9 wherein said fixing means is a bolt at the rotor axis engaged into or through the rotor base and the head of said bolt is in turn protected by a cap substantially centrally positioned with respect to said first  
10 component.

11. A distributor assembly as claimed in claim 10 wherein said cap is provided with a wear resistant surface and is at least in part received within a recess centrally of said first component above the head of said bolt.

12. A distributor assembly as claimed in claim 5 or claim 6 wherein there is in  
15 addition at least one further component itself defining a wear resistant surface to be positioned more peripherally than the wear resistant surface of said second component, at least one of said first or second components directly or indirectly providing a capturing or locating effect with respect to the rotor of the additional component or components.

20 13. A distributor assembly of any one of the preceding claims wherein the wear resistant surface of said second component is of substantially a simple horizontal annulus or a shallow rise frustoconical variant of such an annulus.

14. A distributor assembly as claimed in any one of the preceding claims wherein said first component is substantially of conical (which includes frustoconical), dome or  
25 bell shape in nature.

15. A distributor assembly as claimed in any one of the preceding claims wherein said wear resistant surface of said first component is symmetrical about the axis of the rotor.

16. A distributor assembly as claimed in any one of the preceding claims  
30 substantially as hereinbefore described with reference to any one or more of the accompanying drawings.

17. A **first component** for a distributor assembly as claimed in any one of the preceding claims.
18. A **second component** for a distributor assembly as claimed in any one of claims 1 to 17.
- 5 19. **In or for a rotary mineral breaker, a multi-tiered distributor plate** being a composite of at least
- a first component in the rotor or capable of being positioned in the rotor so as to be surrounded at least in part by a second component, and
- a said second component,
- 10 the arrangement being such that in use said first component assists in locating a mineral contacting part of said second component about the rotor axis.
20. Apparatus of claim 19 wherein said second component defines an annular or the like region about a central region, the central region being defined at least in part by said first component.
- 15 21. Apparatus as claimed in claim 19 or 20 wherein each of said first and second components is fabricated so as to be provided with a wear resistant surface.
22. Apparatus of any one of claims 19 to 21 wherein said first component at least in part overlies said second component.
23. Apparatus of any one of claims 19 to 22 which in use in the rotor of a rotary
- 20 mineral breaker provides or will provide an assembly of any one of claims 1 to 16.
24. A **distributor plate** for a rotary mineral breaker comprising or including
- a first component capable of being positioned at least in part over and at least in part within a second component, and
- a said second component, the two components being capable in a rotor of
- 25 defining a compound mineral distributing surface contour over at least part of the base of the rotor.
25. A distributor plate of claim 24 wherein said first component is capable of being fixed to the rotor at the rotor axis.
26. A distributor plate of claim 24 or 25 wherein each such component has been
- 30 formed of a substrate material carrying a wear resistant material such that, in use, such wear resistant material defines said mineral distributing surface contour.

27. A distributor plate of any one of claims 24 to 26 which in use in the rotor of a rotary mineral breaker provides or will provide an assembly of any one of claims 1 to 16.
28. A distributor plate of any one of claims 19 to 27 wherein each of said first and  
5 second components has at least part of the surface thereof forming or to form part of said compound mineral distributing surface contour defined by an appropriate sacrificial material.
29. A distributor plate as claimed in claim 28 wherein said appropriate sacrificial material is a carbide.
- 10 30. A distributor plate as claimed in claim 29 wherein said appropriate carbide is tungsten carbide.
31. **A method of providing a compound mineral distributing surface contour in the base of the rotor of a rotary mineral breaker, said method comprising or including**  
15 assembling by pre-assembly or sequential positioning within said rotor a first and second component of a kind as defined in any one or more of claims 1 to 16 and 19 (if sequentially positioned, said second component being placed first), and thereafter attaching said first component to the rotor so as to capture both said second component and said first component to the rotor base.
- 20 32. **In or for a rotary mineral breaker, a composite distributor plate being an assembly of two or more members, each of which members has a carbide wear resistant surface.**
33. Apparatus of claim 32 fixed to the base of the rotor of such apparatus by one of said members only, at least one other such member being rotatably captured to the rotor  
25 by that member fixed to said rotor base.
34. A mineral distribution component substantially of a kind hereinbefore described with reference to any one or more of the accompanying drawings of or for a rotor of a rotary mineral breaker and which component forms or is to form part only of a mineral distributing surface of such a rotor over or as part of the base thereof.

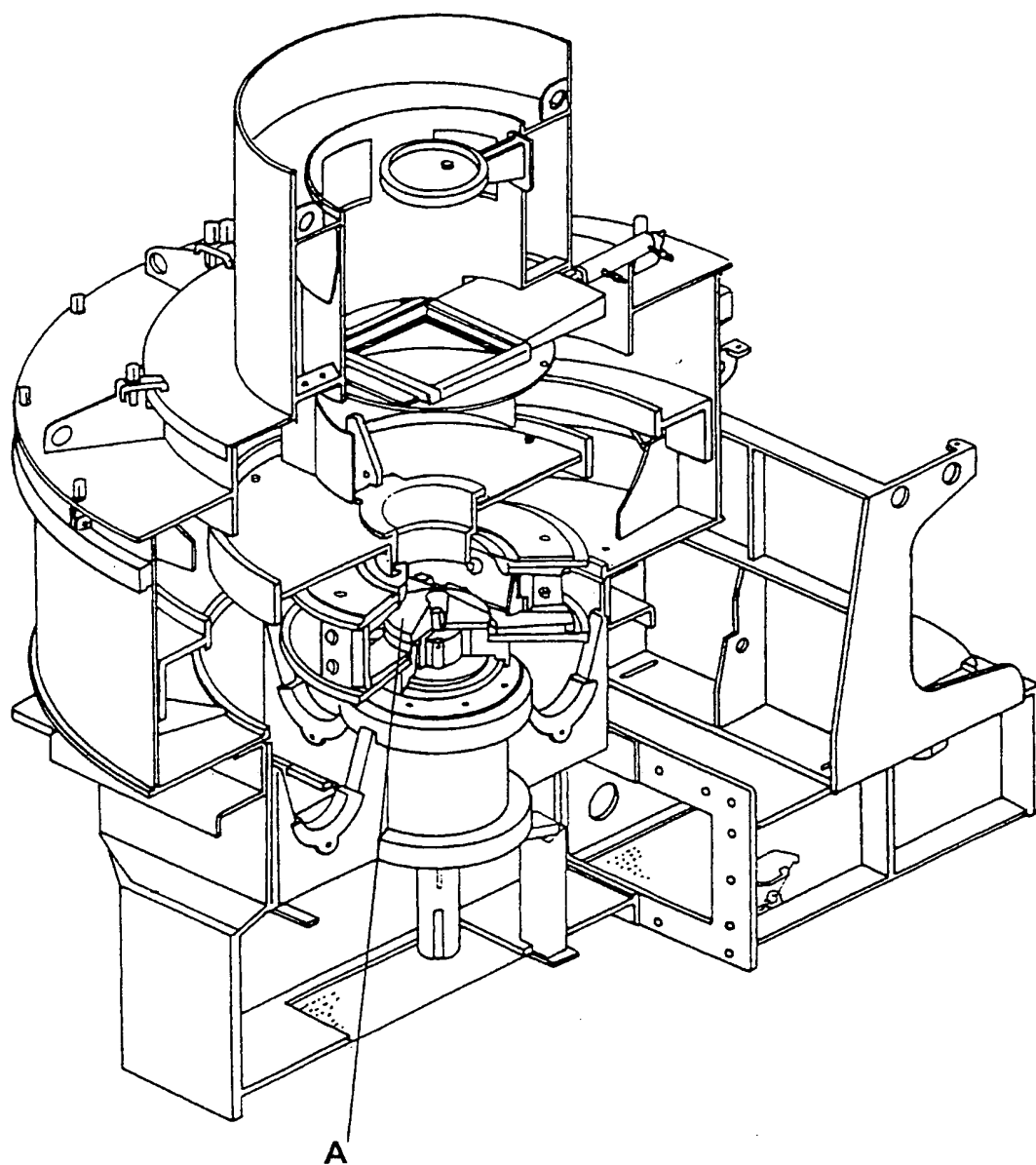
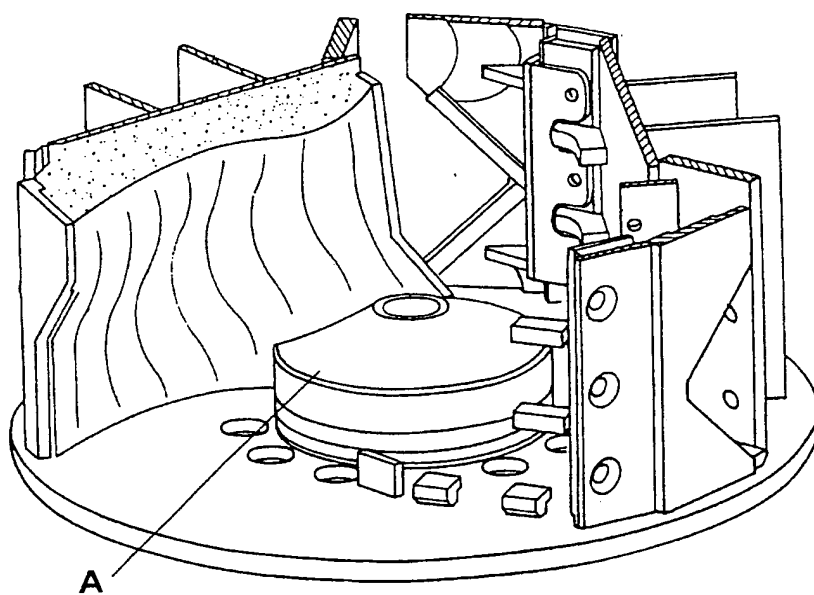
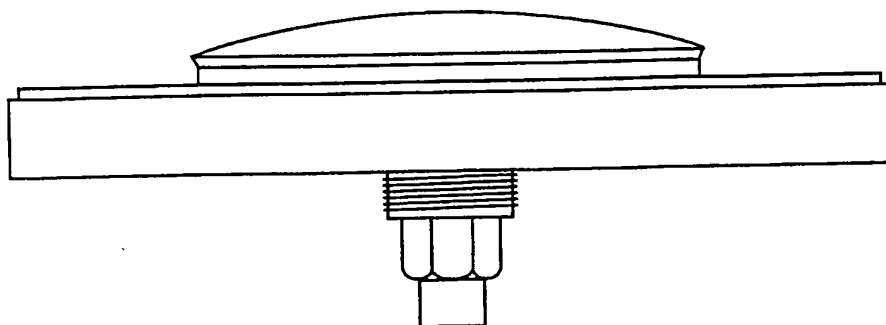


FIGURE 1A

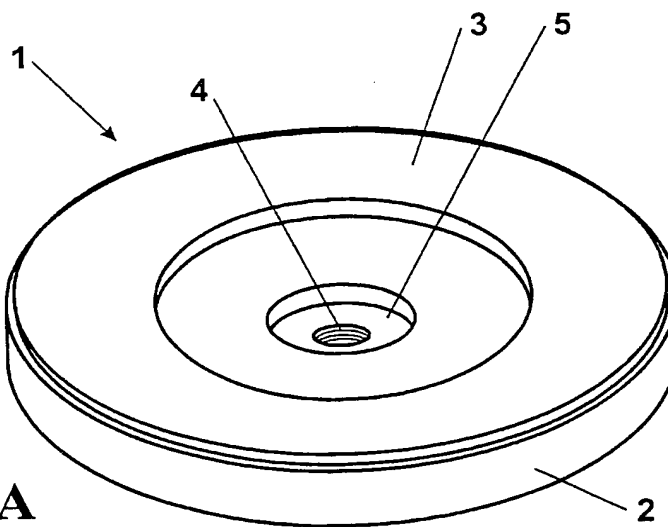




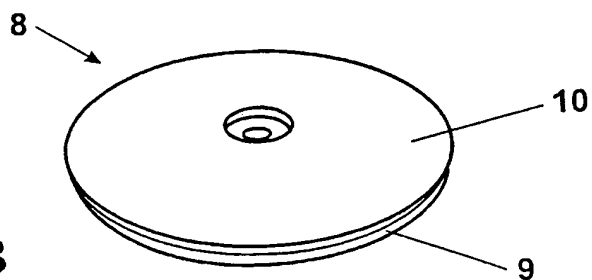
**FIGURE 1B**



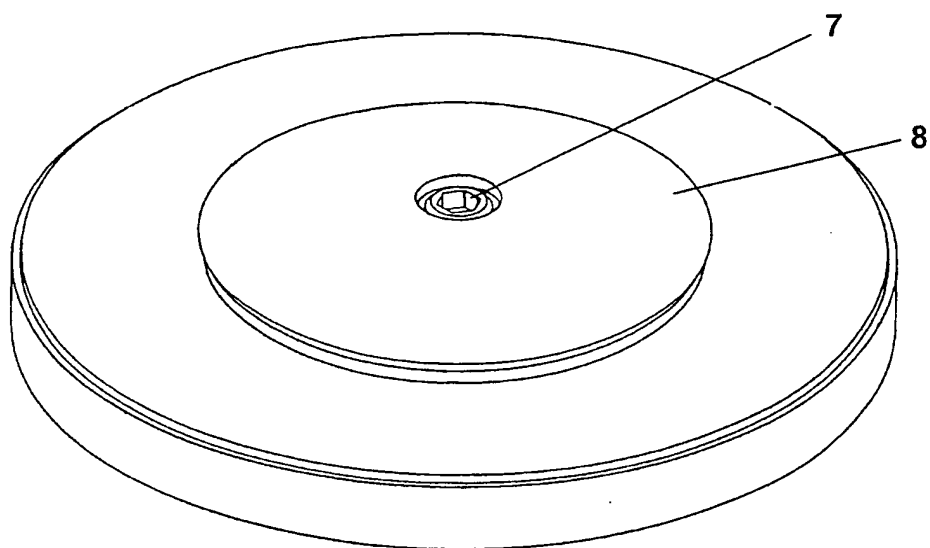
**FIGURE 2**



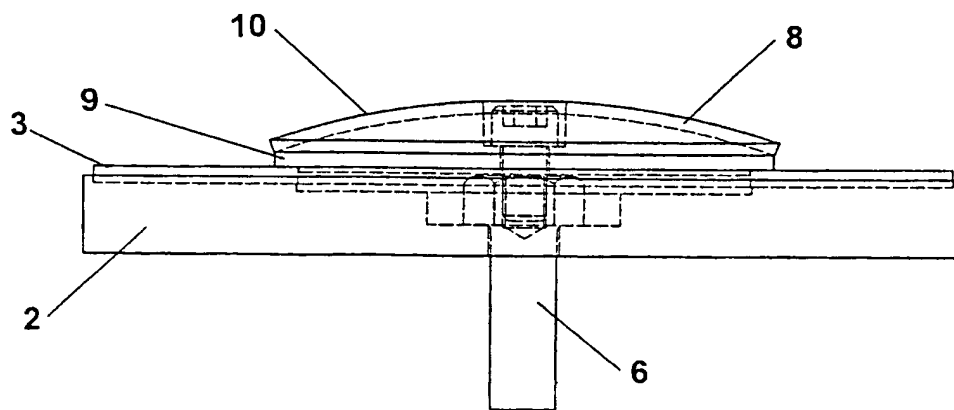
**FIGURE 3A**



**FIGURE 3B**



**FIGURE 4**



**FIGURE 5**

FIGURE 6

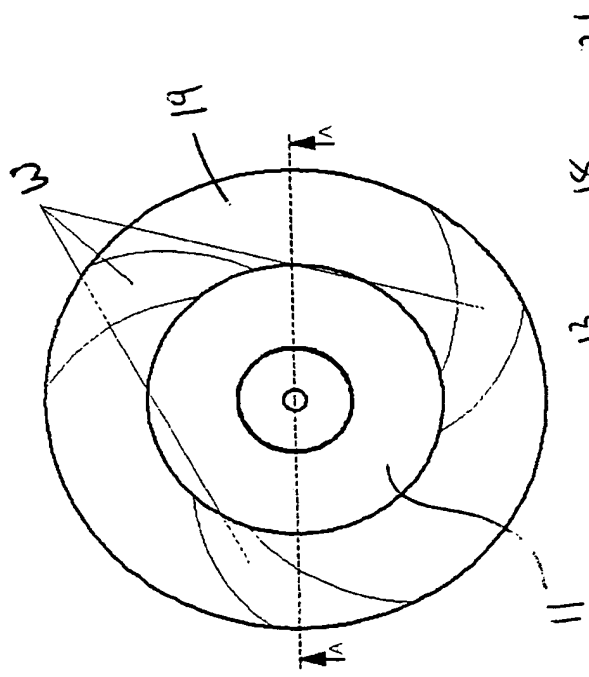


FIGURE 8

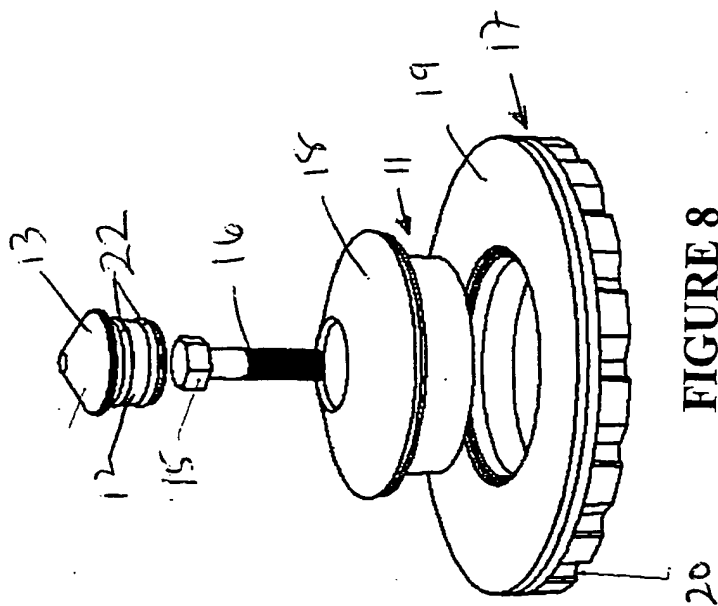
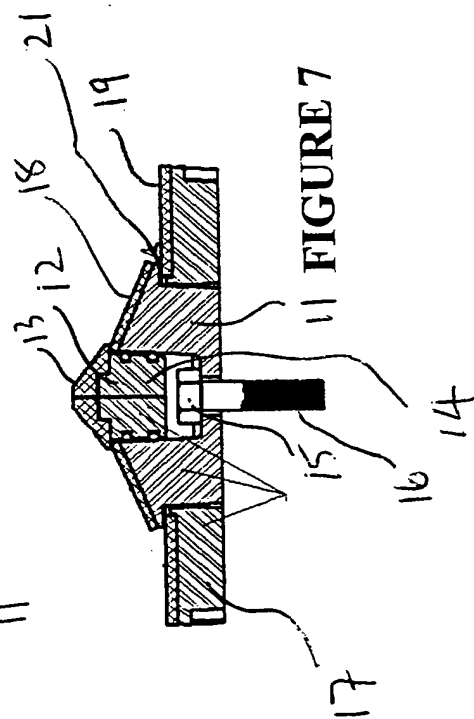


FIGURE 7



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ00/00208

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int. Cl. <sup>7</sup> B02C 7/08		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) B02C 7/08, 7/12		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU:IPC as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPAT: ROTOR+		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4065 063 A (Johnson) 27 December 1997 See whole document, especially figure 4	1-3, 5-8, 12-15, 17-33
X	US 4577 806 A (Terrenzio) 25 March 1986 See figures 1-7	1-3, 5-8, 12-15, 17-33
X	WO 9511086 A (BARMAC ASSOCIATES LIMITED) 27 April 1995 See figure 8	1-3, 5-8, 12-15, 17-33
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 15 December 2000		Date of mailing of the international search report 21 DEC 2000
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929		Authorized officer  JOHN DEUIS Telephone No : (02) 6283 2146

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ00/00208

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5178 339 A (Pilao) 12 January 1993 See whole document and especially figures 1 and 12	19-23, 32-33
A	WO 9856508 A (SVEDALA BARMAC LIMITED) 17 December 1998	

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/NZ00/00208**Box I** Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos :  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos :  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos :  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

**Box II** Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See attached sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

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**Supplemental Box**

(To be used when the space in any of Boxes I to VIII is not sufficient)

**Continuation of Box No: II**

The International application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming this conclusion the International Searching Authority has found that there are four inventions:

1. Claims 1, 24 and 31 are directed to a distributor plate for a rotary mineral breaker comprising a first component and a second component wherein, the first component at least in part is steeper with respect to the horizontal surface of the second component. It is considered that the above integers comprises a first "special technical feature".
2. Claim 17 is directed to a first component for a distributor assembly. It is considered that the above integers comprises a second "special technical feature".
3. Claim 18 is directed to a second component for a distributor assembly. It is considered that the above integers comprises a third "special technical feature".
4. Claims 19 and 32 are directed to a distributor plate for a rotary mineral breaker comprising an assembly of two or more members. It is considered that the above integers comprises a fourth "special technical feature".

Since the above-mentioned groups of claims do not share either technical features identified, a "technical relationship" between the inventions, as defined in PCT Rule 13.2 does not exist. Accordingly the International application does not relate to one invention as a single inventive concept



**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
**PCT/NZ00/00208**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member				
US	4065063	NONE					
US	4577806	AU	35358/84	DE	3442133	JP	60150847
		US	4796822	US	4579290	US	4513919
WO	9511086	AU	80061/94	BR	9407849	CA	2174644
		CZ	9601150	EP	724484	NZ	250027
US	5178339	US	5249734				
WO	9856508	AU	79426/98	EP	1009527	NZ	328062
		ZA	9805037				
END OF ANNEX							